

THE "ZOROASTRIAN" CALENDAR*

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The Arab conquest brought the Mohammedan lunar calendar to Persia in A. D. 651. But the Persians rather used the vague solar year of 365 days. (This was also the tax year.) Only in 1079 did a Seljuq ruler reform the solar calendar by ordering the intercalation of a day every four years. Muslim and Zoroastrian scholars of post-Islamic Persia regarded the vague solar year as a relic of the Sassanid' empire. This idea is confirmed by the fact that solar years were counted from the accession (or from the death) of Yazdagird III (632—51), the last Sassanid ruler. Thus, the solar calendar of post-Islamic Persia can be regarded as the official reckoning of the later Sassanid empire.¹

I

The year of 365 days, being almost six hours shorter than the solar year, advances by about one day in four years with regard to the sun. Accordingly, the Julian (and then our Gregorian) calendars insert an extra day every four years. But in the Persian solar year the days changed their position backward with reference to the Julian year at every bissextile of the latter. Thus, the Persian New Year's day which fell on 16 June in A. D. 632² corresponded to 15 June in A. D. 636. Accordingly, a synchronism between a day of this wandering year and a Julian day makes it possible to reduce any date of the vague year to its Julian equivalent.

By the same token, we can calculate the beginning of the Persian reckoning. Arab astronomers in agreement with contemporary Persian sources (in Pahlavi) assert that in principle the beginning of the Persian

* Abbreviations: Biruni, Ginzl, Hyde, Ideler — see n. 1. Lewy = H. Lewy, *Orientalia*, XI (1941); Nilsson = M. P. Nilsson, *Primitive Time-reckoning* (1920); Nyberg = *Die Religionen des alten Irans* (1938); Nyberg, "Texte", see n. 1; Taqizadeh = S. H. Taqizadeh, *Old Iranian Calendars* (1938).

¹ The sources have been collected and translated in Thomas Hyde, *Veterum Persarum... religionis historia*, 2nd ed. (1770), pp. 200 ff. The sources have also been examined in L. Ideler, *Handbuch der Chronologie*, 2 (1825), pp. 520 ff. F. K. Ginzl, *Handbuch der Chronologie*, 1 (1903), pp. 290 ff., depends on Ideler. The only important Arabic source discovered after Hyde is Biruni's *al-Athar al-Baqiya*, written ca. A. D. 1000. I used English (E. Sachau, 1879) and Russian (M. A. Sal'e, 1957) translations, but quote the pages of Sachau's edition of the original. These page numbers are marked in the margin of both translations. For Zoroastrian sources see H. S. Nyberg, "Texte zum Mazdayanischen Kalender", *Arsskrift of the Uppsala University* for 1934.

² Ideler, p. 520. Yazdagird's regnal years were counted from this date. Th. Noel-deke, *Geschichte der Perser* (1879), p. 405.

year was to coincide with "the entrance of the sun in the constellation of Aries", that is the time of the vernal equinox.³ As the rotating year of 365 days goes backward one day every four years, it returns to its astronomical starting point in 1460 Julian years. Accordingly, E. W. West, from the Julian date of the Parsee New Year in 1865 (the Parsees continue to use the Persian vague year) could easily compute the year in which the Parsee New Year would have occurred at the date of the spring equinox (March 27th). This would have happened c. 505 B. C.⁴

J. Marquart used the same method as West.⁵ His point of reference, however, was the Cappadocian calendar which, as he believed, was an offshoot of the ancient Persian year. From the synchronism given in Greek sources: 1 Dathusios (Cappadocian) = 1 Thot (Egyptian) = 22 December (Julian),⁶ he calculated that 1 Fravartin, the beginning of the Persian year, would have coincided with the vernal equinox c. 490 B. C.

Impressive as these results are by their astronomical precision, they are based on some historical suppositions which are rather dubious. There is no proof that Fravartin was originally the first Persian month nor that the year originally began at the time of the spring equinox.⁷ Secondly, a calendar system may or may not be introduced at its New Year. Thus, the Gregorian calendar began in England on September 3, 1732. In other words, we should not identify the starting point of a calendar with the date of its introduction. On the other hand, according to the same Muslim scholars who inform us about the Persian vague year, this year was not the original one, but came about by the neglect of the last Sassanids. Before this, the Persian year was regulated and brought into conformity with the seasons by intercalations. From Hyde

³ Hyde, p. 204; Nyberg, p. 34. We do not know what was considered as the vernal point by the ancient Persians. Cf. Lewy, p. 22.

⁴ E. W. West in *Sacred Books of the East*, XLIII (1897), p. XLIII.

⁵ J. Marquart, *Philologus, Supplement*, X (1907), p. 210. He suggested two possible dates: 493—90 or 489—86.

⁶ N. Fréret, in *Mémoires de l'Académie des Inscriptions*, XIX (1753), p. 44 by the same arithmetic method arrived at the conclusion that the Cappadocian calendar had been established in 689, and the Armenian vague year in 809 B. C. (*op. cit.*, p. 102). He started from the premise that the original New Year's date of the Persian calendar was 16 June. It is worthwhile to note that our evidence as to the Cappadocian calendar is still the same that was available to Fréret, and it is inconclusive. Cf. Ginzl, III, p. 28; id. in *Real-Encycl. der Klass. Altertumswissenschaft*, X, c. 1917; K. Hanell, in *Bulletin de la Société des Lettres de Lund*, 1931—932, p. 27. The Cappadocian calendar we know is a local form of the Julian year. Cf. W. Kubitschek, in *Denkschriften der Wiener Akademie*, LVII, 3 (1915); Ginzl, III, p. 25. Only the month names of this calendar are Iranian. Cf. A. D. Nock, *AJA*, 1949, p. 275. Cappadocia was ruled by princes of Persian origin until A. D. 17, and the governing class was also Persian. Cf. L. Robert, *Noms indigènes dans l'Asie-Mineure*, I (1963) p. 513. Thus, there is no reason to postulate that the Zoroastrian names of months point to the Achaemenid origin of the calendar. It is also important to note that the city Hanisa (Kanes of Assyrian texts) in the second century B. C. used the Macedonian calendar. L. Robert, *op. cit.*, p. 457.

⁷ Nyberg, "Texte", p. 377; Lewy, p. 10. According to Biruni, p. 217, the Persian New Year originally fell in the summer.

on [1700] modern scholars neglect this statement of our sources, and rather suppose that the Persians had two solar years: the wandering one in everyday life and the intercalated one in religious life. There is no evidence for this hypothesis.⁸

II

The Persian year was divided into twelve months of thirty days each plus five supplementary days. Every 120th year, however, the kings inserted the thirteenth month. The effect of this was that the New Year's day could not retreat more than thirty days from the vernal equinox and always remained in the sign of Aries. According to the astronomer Abul Hasan Kushyar b. Labban (who died in 985), the mode of intercalation was as follows: the first month of the next year was counted as the thirteenth month of the year of intercalation, and the five epagomenae were moved to the end of this first month. The supplementary days remained here until the next intercalation. The New Year now began with the previous second month.⁹

This elegant solution has been accepted by modern historians. Yet it disagrees with the historical experience. Intercalary months and days postpone the future, they do not anticipate it. The Babylonian intercalary month was Addaru II (or Ululu II) and not Nisannu. Among the pre-Islamic Arabs, if the intercalary month occupied the place of the first (second, and so on) regular month, the next regular month received the name of the first month, and so on, so that the names of all the months were changed. When primitive tribes discover that a season, say of the rains, continues beyond the usual date, they say, we have forgotten, now is the time of the rain month.¹⁰

In fact, as Biruni informs us, the intercalary months remained nameless, nor was there a fixed position for the intercalary month. (The same is true for many primitive peoples.) As in pre-Islamic Arabia, the intercalation passed through all twelve months. As Biruni says, to avoid the uncertainty as to the place of the next intercalary month, the Persians moved the five epagomenae to the end of that month to which the turn of intercalation had proceeded. This precaution was very useful. Among

⁸ Hyde, p. 182; Nyberg, "Texte", p. 39, finds the distinction between the ecclesiastical and civil years in Pahlavi texts, but these texts, according to his own translation, rather distinguish between the ordinary and bissextile years. The festivals belong to the ordinary, 365 day year, and its disagreement with the sun also brings the agricultural year into disorder, though the Zoroastrian writer also insists on the importance of intercalation for feast days. Cf. H. Nyberg, "Texte", pp. 33, 37, 39.

⁹ Kushyar, apud Ideler, 2, p. 624; Ginzel, p. 291. Kushyar died in A.D. 985. Cf. C. Brockelmann, *Geschichte der arabischen Literatur*, 2nd ed., I (1943) p. 253. Biruni, *The Book of Instruction on the Elements of the Art of Astrology*, transl. by R. R. Wright (1934), p. 163, no. 271, repeats the same tradition: The intercalary month doubled a regular month and received its name.

¹⁰ Nilsson, p. 244. On pre-Islamic intercalation in Arabia cf. Biruni, p. 62; Ginzel, p. 243. On Persian intercalation cf. Biruni, pp. 33, 44—45.

primitive tribes the intercalations often provoke quarrels as to the correctness of calculation.¹¹

The Persian intercalation has been misunderstood by modern scholars who assume that the change in the position of the epagomenae must have also moved the New Year's day. Thus, they imagine that when the residual days became placed after Fravartin, the first month, Artavahisht, the second month of the series, opened the year. But the festival days are anchored in their months. The intercalations do not change the date of Passover. It was and is always celebrated on 14 Nisan. Likewise, in the time of Biruni the New Year's day fell on 1 Fravartin, though the epagomenal days stood after Avan, the eighth month. The intercalation mechanism worked as follows: suppose that before the intercalation the residual days are attached to the month of Fravartin. In the year of intercalation the epagomenal days will be moved to the end of Artavahisht, the following month, and a nameless period of thirty days will be inserted after (or before?) this month. The next New Year, on 1 Fravartin, will now coincide with the vernal equinox.

In the vagabond year of post-Sassanid Persia, the five supplementary days stood after the eighth month (Avan). Persian savants accordingly concluded that the latest and last intercalation was the eighth. Afterwards, as Biruni says, the Sassanids became disturbed by calamities and then "both their empire and their religion perished". In this way, the Persian solar year became the vague year on account of neglected intercalation.

If the last intercalation was the eighth, it means that it was carried out $120 \times 8 = 960$ years after the beginning of the Qutb ad-din cycle, as an astronomer of the fourteenth century, already noted.¹² The late sources collected by Hyde in 1700 attributed the last intercalation to the last Sassanid king, Yazdagird III who reigned from 632 to 651. This brings the beginning of the 960 year period to 328 B.C., that is, to the time of Alexander the Great. But Fréret in 1742 believed he had found a reference to the use of the Persian reckoning as early as 560 B.C. in a Chinese astronomical book. He calculated that 560 B.C. would be the tenth year of an intercalation period of 120 years. In this way, he arrived at 1769 B.C. as the starting point of the Persian reckoning.¹³ A generation

¹¹ On the position of intercalary months cf. Nilsson, p. 246. On the uncertainty as to the beginning of the year, cf. Nilsson, p. 267. The government could by its fiat move the New Year's day to any date in the solar year as the Abbasid caliph Mu'tadid (892—902) did according to Biruni, p. 31, but on the way, the whole month of Fravartin was moved ahead. On 1 Fravartin as the New Year's day cf. Biruni, p. 45; Nyberg, "Texte", p. 22.

¹² Biruni, p. 44; Qutb ad-din apud Hyde, p. 203. Qutb ad-din died in A.D. 1313. Brockelmann, *op. cit.*, II (1949) p. 274. The main source of Hyde was Mahmud Shah Khulji, on whose work cf. E. S. Kennedy, *Transactions of the American Philosophical Society*, XLVI, 2, p. 125, n. 6.

¹³ N. Fréret, "De l'ancienne année des Perses" in *Mémoires de l'Académie des Inscriptions*, XVI (1751), p. 239.

later, the astronomer J. S. Bailly, adducing some astronomical proofs, removed the beginning of the Persian calendary system to 3209 B. C.¹⁴ Bailly, the future mayor of revolutionary Paris (and a victim of the Reign of Terror) was probably not averse to showing that the Zoroastrians had a calendary system long before Moses and even before the Deluge.

J. B. Gibert was more prudent.¹⁵ In 1769 he tried to combine the data of Arabic sources about the wandering year and about intercalation. His calculations established that 1 Fravartin in the vague year had coincided with the vernal equinox in 484—481. Thus, in 1768 he anticipated the hypothesis of J. Marquart published in 1905. On the other hand, following the aforementioned Kushyar (quoted by Hyde), he attributed the last intercalation to Chosroes I (A. D. 531—79). This brought the date of the beginning of the cycle to 428—381. He now supposed that the cycle began on March 12th in 424 B. C., when the first day of both the wandering and of the fixed year happened to coincide.

A century later, in 1862, A. von Gutschmid, as Fréret before him, based his calculations on the count of intercalations alone.¹⁶ Like Gibert, whom he neglects to mention, he placed the last intercalation under Chosroes I and naturally came to the same arithmetic result: the reckoning began between 428 and 381 B. C. As Fréret he believed that the Armenian calendar simply continued the Persian system (though the Armenian year had no intercalation whatsoever). Noting that in 428 the Armenian calendar would have disagreed by some days with the supposed calendary schema of the Persian year, he supposed without a shade of proof that the Persian calendar was started not on the first but on the nineteenth of Fravartin. In this way he came to the date 411 B. C. As late as 1939, an American scholar asserted that Gutschmid for the first time had "correctly explained the arrangement of the Persian calendar".¹⁷ In 1889 E. Drouin¹⁸ returned to simple arithmetic, and counting back from Chosroes' accession (A. D. 531) arrived at 309 B. C. as the date of the first intercalation. He believed that before this date the Persians had a wandering year.

The latest, though probably not the last scholar who again tried the same key to the same secret door, was S. H. Taqizadeh. Following Biruni, he placed the last intercalation under Yazdagird I (399—420), and counting backward from A. D. 399, he arrived at 441 B. C. as the date for the establishment of the calendar. "This was the seventh intercalation

¹⁴ J. S. Bailly, *Histoire de l'astronomie ancienne*, 2nd éd. (1781), p. 354.

¹⁵ J.-B. Gibert, "Nouvelles observations sur l'année des anciens Perses", *Mémoires de l'Acad. des Inscriptions*, XXXI (1768), p. 68. Cf. Hyde, p. 205; Ideler, p. 624; Ginzel, p. 291. According to S. H. Taqizadeh, p. 5, Gibert, following him Gutschmid, and other modern translators misunderstood the passage in question.

¹⁶ A. von Gutschmid, *Kleine Schriften*, 3 (1892), pp. 205 ff.

¹⁷ M. J. Higgins, "The Persian War of the Emperor Maurice". *The Catholic University of America: Byzantine Studies*, 1 (1939), p. 2.

¹⁸ E. Drouin, *Revue Archéologique*, 3^e Série, 18 (1889), p. 252.

when the seventh month (Mihir) had to be repeated according to the established rule."¹⁹ But Biruni does not say anything about the seventh intercalation or the month Mihir. Biruni rather says that Yazdagird I intercalated two months, one to rectify past deficiencies, and the other as a precaution against future negligence. In Yazdagird's intercalation, as Biruni expressly states, the turn came to Avan, the eighth month.²⁰ Thus, it was the eighth intercalation, and the cycle must have begun between 561 and 549 B. C.

As a matter of fact Biruni (A. D. 973—1048) and other astronomers noticed that in the vague Persian year of their time the five residual days stood after the eighth month and not, as it would be natural to expect, at the end of the year. [The epagomenal days were again placed after the twelfth month in 1006.]²¹ They supposed, and they were probably right, that the anomaly was caused by intercalations. They knew that the Persians intercalated complete months. They accordingly concluded that the latest intercalation was the eighth. Unfortunately, they had no certain tradition as to the date of the last intercalation. Some assigned it to the reign of Yazdagird III, the last Sassanid king, others spoke of Chosroes I. Biruni attributed the rectification to Yazdagird I, and he was even able to give the name of the savant who carried out the intercalation under Yazdagird I.²² Unfortunately, in a later work (*Qanun-i-Masudi*), Biruni places the last intercalation under Peroz (459—84).²³

¹⁹ Taqizadeh, p. 36. Otherwise, the author supports his hypothesis with unsupported suppositions ("It seems to me reasonable to suppose...") of a psychological kind. For instance, it "is more likely" that the (supposed) transfer of the Persian year near the vernal equinox was the year on which the Babylonian New Year also fell not far apart of the same equinox (p. 33), and so on. In 1952, the author restated his hypothesis with some changes (*BSOAS*, 14, p. 603). He now believes that the intercalation rule was "theoretical and without any application in daily life" (p. 603), and that the Babylonian calendar was the official one probably through the whole Achaemenid period (p. 604). Yet he still believes that the Egyptian year "perhaps" was adopted by the Zoroastrian community c. 505, places the beginning of the intercalation system c. 441, and ends by suggesting (p. 607) that "the possibility that the Achaemenian kings were converted to Zoroastrianism at the same date (441 B. C.) must occur to any student of the question after perusal of what has been said above".

²⁰ Biruni, p. 45. Cf. Biruni, *The Book of Instructions in the Elements of the Art of Astrology*, transl. R. R. Wright (1934), p. 168 n. 274: the last Persian intercalation occurred in the month of Aban. The five supplementary days are inserted after Aban as an indication of the month which was last duplicated.

²¹ The epagomenal days continued to be placed after the eighth month in the Caspian province and in Khorasan. S. H. Taqizadeh, *BSOAS*, 9 (1937—1939) p. 918.

²² Biruni p. 45. Chosroes revised astronomical tables. Cf. D. Pingree, *Isis*, 54 (1963), p. 243; E. S. Kennedy, B. L. van den Waerden, *JAOS*, 73 (1963) p. 325. According to Biruni, *al-Qanun al-Masudi* as quoted in S. H. Taqizadeh, *BSOAS*, 9 (1937—1939), p. 134. Biruni heard that an assembly of astronomers had verified astronomical tables in the twenty-fifth year of a Persian king. But he could not ascertain whether this king was Chosroes I, Chosroes II or some other Sassanid.

²³ Taqizadeh, p. 37; *id.*, *BSOAS*, 9 (1937—1939), p. 135. The passage in question can now be found in the Hyderabad edition of Biruni's *Qanun*, I (1954), p. 132: the last of the intercalations was in the days of Peroz, son of Yazdagird. [I owe this information to my colleague Gerson Cohen.]

I am unprepared to choose between these kings.²⁴ I must confess, however, that the idea of intercalations carried on each 120 years during a millennium, from the Achaemenids to the Sassanids, does not strike me as a probable conjecture.²⁵ It is difficult to believe that in the fifth century B. C. the Persians had the capacity for such ideas. When Darius I had to instruct his Ionian officers, who were fellow-citizens of Thales and Pythagoras, to wait sixty days for him, he gave them a piece of rope with sixty knots and told them to untie one of the knots day after day.²⁶ It is rather probable that the Persian intercalated haphazardly, according to need,²⁷ and that the theory of the 120-years intercalation was invented by the Zoroastrian savants of post-Islamic Persia to account for the position of the epagomenal days in the wandering year.

In 1941 Hildegard Lewy propounded a more complex theory. The vague year of 365 days was established by Mithridates II of Parthia c. 120 B. C.; the intercalation was introduced by Ardashir I in A. D. 228 but there were two systems of intercalations, one in the religious another in the civil calendar. Unfortunately, the learned author bases her theory on astronomical calculations which in turn depend on arbitrary conjectures. Thus, Biruni says that when kings transferred their residence from Balkh (eastern Bactria) to Persis and Babylon (that is in the age of Cyrus or perhaps, in Parthian times) they corrected the calendar by five days with reference to the summer solstice. Biruni's modern interpreter substitutes a Sassanid for a mythical king and instead of solstice speaks of vernal equinox. Having found that in A. D. 228, according to her calculations, the month of Mihr would have coincided with the sun in Aries, the modern author decides that at this time Mihr was the first month of the year, and therefore Ardashir I was the reformer spoken of by Biruni.²⁸

III

Let us now pass from speculation to fact. The Sassanid calendar, as it is known to us from Biruni and other Islamic sources, betrays the great influence of Zoroastrianism in the month names, and, particularly, in the names of days.²⁹ (Each day had its proper name which was the

²⁴ Higgins, *op. cit.*, votes for Yazdagird I, Lewy, p. 27, prefers Chosroes I.

²⁵ Nyberg already emphasized the improbability of the intercalatory cycle.

²⁶ Herod. 4, 98.

²⁷ Nilsson, p. 243. A Pahlavi text (Denkart) forbids intercalating more than five months at once. Nyberg, "Texte", p. 39.

²⁸ Lewy, p. 40 on Biruni, p. 234. Names of months and days in the Chorezmian calendar follow the model of the younger Avestan reckoning. But the evidence is from the VIIth c. A. D. W. B. Henning, *Asia Major* n. s. XI (1965), p. 167.

²⁹ The hypothesis that the use of religious day names betrays the Egyptian origin of the Zoroastrian calendar (Nyberg, p. 377) is unfounded. The Egyptians did not use the day names in dating as the Persian did. Cf. also St. Wikander, *Feuerpriester* (1946), p. 229; S. Weinstock, *JRS*, 19 (1949), p. 57.

same in all months. For instance, the first day of each month was named after the supreme god Ahuramazda.)

Accordingly, Iranists believe that the initial date of this calendar must give us a fixed point in the history of the Zoroastrian religion. "This is the only concrete evidence of the Achaemenids accepting Zoroastrian ideas."³⁰ Haunted by this idea, the Iranists accept with docility any date suggested by chronologists for the establishment of the calendar, be it 485, 411, or 441 B. C. As a matter of fact, there is no necessary connection between the invention of names of months and days used in a calendar and the date of its introduction.³¹ The names of our months had been in use long before Caesar established the Julian calendar. Let us deal with each problem separately: first the Zoroastrian names, then the Sassanid calendar.

Islamic sources which give the names of months and days in the Sassanid calendar are confirmed by documentary evidence. Thus the name of the month "Spandarmat" occurs in Persian papyri written in Egypt c. A. D. 620.³² A royal inscription found at Bishapur was erected under Shapur I in the month of "Fravardin", which was, as the text implies, the first month of the year at this time. The Pahlavi graffiti painted in the synagogue of Dura-Europus in the fourteenth and fifteenth years of the same king mention the months "Fravardin" and "Mihr" and the day "Rashnu".³³

An inscription of Artabanus (V), the last Arsacid king is dated: "Year 462, [month] Spandarmat, day of Mihr."³⁴ A Pahlavi contract written in the year "300", that is, probably, in A. D. 54/55, refers to the month of "Harvatat".³⁵ Aramaic ostraca from Parthian Nisa preserve accounts dated by months and days of the "Zoroastrian" calendar. One of these texts has been published. It contains the name of the month *Hrwat* that is "Harvatat".³⁶ This ostrakon written in 90 B. C. is the earliest datable evidence as yet for the "Zoroastrian" calendar. On the other hand, the documents from the treasury of Persepolis prove that as late as 459 B. C. the Zoroastrian month and day names were not used by the Achaemenids. Thus, the Zoroastrian names for months and days were introduced in

³⁰ W. Culican, *The Medes and the Persians* (1965), p. 174. Cf. also Nyberg, p. 376; J. Duchesne-Guillemin, *La religion de l'Iran ancien* (1962), p. 120; R. N. Frye, *The Heritage of Persia* (1963), p. 115; I. Gershevitch, *JNES*, 23 (1964), p. 21.

³¹ J. Duchesne-Guillemin, *op. cit.*, p. 168 has already made this observation.

³² O. Hansen, *Abhandlungen der Preuß. Akad.*, 1937, № 9, p. 20.

³³ Frye, *op. cit.*, p. 199; S. Kraeling, "The Synagogue", p. 300 in *The Excavations of Dura-Europos*, 8, 1 (1956).

³⁴ W. B. Henning, *Asia Major*, 2 (1952), p. 176.

³⁵ W. B. Henning, "Iranistik" (1958), p. 29 in B. Spuler's *Handbuch der Orientalistik*.

³⁶ I. M. Diakonov, V. Livshiz, *Documenty iz Nisy* (1960), p. 22, № 2167. Prof. Diakonov kindly informs me that new and very interesting material from Nisa concerning month names is going to be published by Prof. Livshiz. The Aramaic inscription at Naqsh-e Rostam which exhibits the proper name "Seleucus" and mentions the month "Spandarmat" is of uncertain date. E. Herzfeld, *Altperische Inschriften* (1938), p. 12; W. B. Henning, *op. cit.*, p. 24. Cf. also J. de Menasce, *J. As.*, 241 (1956), p. 428.

the Persian official calendar between 459 and 90 B. C. My guess is that the "Zoroastrian" calendar was brought by the Parthians from Central Asia.

As to the solar calendar, the Behistun inscription of Darius I and the accounts from Persepolis prove that from the beginning and until 459 B. C., at least, the Achaemenids used the Babylonian lunisolar calendar, though they substituted Iranian names for the Babylonian in Iranian documents.³⁷ Further, Aramaic documents from Egypt prove that from 471 to 401, at least, the Persian administration used the same Babylonian calendar.³⁸ Since almost all of these Aramaic documents happened to come from the Jewish military colony at Elephantine, the reckoning was regarded as Jewish. I often protested against this misunderstanding.³⁹ A newly published Aramaic papyrus,⁴⁰ written for a Sidonian, probably at Abydos, in 417 B. C. and dated 3 Kislev = 11 Thod confirms my view. Thirdly, Aramaic papyri from Samaria prove that the imperial administration continued to use the Babylonian lunisolar calendar until the end of the Achaemenids.⁴¹ The Macedonian rulers of Iran followed this practice.

In the absence of dated documents of the fourth century, we cannot prove or disprove the assumption that the Achaemenids continued to use the Babylonian lunisolar calendar until their fall, but it is quite likely.⁴¹

The same is true for the first 250 years of the Arsacids, as a Greek letter of Artabanus III of the year A. D. 21 proves.⁴²

But the above-mentioned inscription of Artabanus V which contains the "Zoroastrian" name of the month "Spandarmat" and of the day "Mihr" poses a problem. The inscription was engraved in the year "462" of the Arsacid era. The years of this reckoning, starting from the spring of 247 B. C., were the Babylonian lunisolar months. Did the Arsacids, as the Achaemenids before them, substitute Iranian names for the Babylonian names of months and days in documents written in Parthian and other

³⁷ A. Poebel, *AJS*, 55 (1938), p. 130; G. G. Cameron, *Persepolis Treasury Tablets* (1948), p. 34; I. Gershevitch, *Asia Major*, II (1951) p. 133. G. G. Cameron, *JNES* XXIV (1965), p. 167.

³⁸ A. E. Cowley, *Aramaic Papyri* (123), № 5 and E. G. Kraeling, *The Brooklyn Museum Aramaic Papyri* (1953), № 10.

³⁹ Cf. my *Chronologie* (1933), p. 16 and my *La cronologia nel mondo antico* (1963), p. 37.

⁴⁰ J. Teixidor, *Syria*, 41 (1964), p. 285.

⁴¹ F. M. Cross, *Biblical Archaeologist* XVI (1963), p. 110 ff. quotes the dating: "20 Adar, year 2 (which is) the accession year of Darius (III) the king". Curtius, III, 3, 10 describing a festival of 333 B. C. says that 365 young men followed the Magi in the procession before Darius III, *diebus totius anni pares numero, quippe Persis quoque in totidem dies discriptus est annus*. This shows that the Persian magi knew that the solar year consisted of 365 days. The Babylonians, Greeks, Jews and so on, also knew this elementary fact, but their calendars remained lunar.

⁴² C. B. Welles, *Royal Correspondence* (1934), № 75.

Iranian languages? The Manicheans did it,⁴³ and the preserved equations: 4 Shahrevar = 4 Addaru and 8 Mihr = 8 Nisanu prove that the first month of the Iranian year (Fravardin) corresponded to the Babylonian Tashritu. The Manicheans may have followed the Arsacid practice. Yet, we must keep in mind the possibility that the Arsacids (or the later Arsacids at least) used two eras both starting in the spring of 247 B. C., one in Babylonian lunisolar style, and another, in Iranian documents, which was reckoned in solar years. In post-Islamic Iran the Hegira era was counted both in Mohammedan lunar years and for taxation purposes in solar years.⁴⁴

The post-Islamic sources tell us that the Sassanids used the solar calendar in the whole empire.⁴⁵ But there is no documentary evidence as yet for their practice. The Sassanids were wary of giving chronological references in their inscriptions. Shapur I could relate his victorious campaigns and a grandee commemorate the building of a bridge without any date.⁴⁶ As a matter of fact, the functioning of the Sassanid solar calendar is unknown as yet. The synchronisms known as yet are rare⁴⁷ and often, as for instance the dates of Mani's life,⁴⁸ uncertain.

We are unable to say when and why the Sassanids introduced the solar calendar. Its derivation from the Egyptian year is rather doubtful. The schematic year of twelve months and 360 (or 365) days was practised by many peoples besides the Egyptians. Fréret already quoted the example of the Aztecs. In pre-Spanish Peru the year also consisted of 12 X 30 + 5 days. In Vedic sources, the year was divided into twelve months of thirty days each. The Babylonians as well as the Athenians in business life, for instance in calculating interest, and for fiscal accounting used the standard month of thirty days. The same is true for Babylonian (and Assyrian) religious fasti. The Persepolis tablets show that the Persian administration used the same conventional time-unit for payments in kind (grain, wine and so on) to workers.⁴⁹ Thus, the Sassanid

⁴³ W. B. Henning, *JRAS* (1944), p. 146; *id.*, *Asia Major*, 3 (1952) p. 200. The Zoroastrian theologians combined their theory of twelve millennia of the world with the Babylonian (Seleucid) era from 311 B. C. Cf. H. Lewy, *JAOS*, 64 (1944), p. 38; S. H. Taqizadeh, *JRAS* (1947), p. 36; E. S. Kennedy, B. L. v. d. Waerden, *JAOS*, 73 (1963), p. 315.

⁴⁴ S. H. Taqizadeh, *BSOAS*, 9 (1937-1939), p. 205.

⁴⁵ Biruni, p. 11.

⁴⁶ A. Maricq, *Classica et Orientalia* (1965), p. 37; W. B. Henning, *Asia Major*, 4 (1954), p. 98.

⁴⁷ Higgins, *op. cit.*, p. 15. Royal horoscopes of Sassanids are later computations. D. Pingree, *JAOS*, 82 (1962), p. 496.

⁴⁸ W. B. Henning, *Asia Major*, 3 (1952), p. 196; S. H. Taqizadeh, *op. cit.*, 6 (1957), p. 107; Maricq, *op. cit.*, p. 80.

⁴⁹ Fréret (n. 13), p. 238; Sontheimer *RE*, 16, 46 (on Athens). The Babylonians widely used the schematic calendar of thirty-day months. Cf. O. Neugebauer, *JNES*, 1 (1942), p. 400; S. Langdon, *Babylonian Menologie* (1945); R. Labat, *Hémérologies et ménologies d'Assur* (1939). The compendium *mul Apin* offers a schematic list of 12 X 30 days for calculating celestial phenomena (Scorpio rises on the fifth day of the eighth month, and so on). The year begins with the appearance of Aries. W. K. Pritchett,

year may be an adaptation of a fiscal or sacral year of great antiquity. It may be the Sassanid answer to the Julian year. There were several local forms of the Julian calendar arranged according to the scheme of $12 \times 30 + 5$ days: in Ascalon, Gaza, Cappadocia, and the Roman province of Arabia, organized in A. D. 105. Yet, these calendars of Egyptian type were Roman innovations.⁵⁰ Was the Sassanid calendar an innovation? We just do not know.

Our conclusions are as follows: 1) The Achaemenids used the Babylonian lunisolar calendar. 2) The Arsacid used the same calendar, yet the possibility cannot be excluded that they may also have used the solar year in Iranian documents. 3) The functioning of the Sassanid solar year remains unknown, though the post-Islamic sources mention an intercalation in the fifth century A. D. 4) The use of Zoroastrian names for months and days is first attested in 90 B. C. 5) These results concern only the official calendar. As in post-Islamic Persia and in modern Afghanistan,⁵¹ there could have been other calendars used locally or for different purposes.

B. L. van der Waerden, *Bulletin de correspondance hellénique*, LXXXV (1961), p. 42. On Vedic year, cf. Ginzel, I, p. 312; L. Renou, J. Filliozat, *L'Inde Classique*, II (1953), p. 178. On accounting in Persepolis cf. Cameron, n. 37; I. M. Diakonov, *Vestnik Drevnei Istorii*, 1959, n. 4, p. 79. The Babylonian accounts, which are based on the schematic month of thirty days, are very similar. Cf. e. g. F. X. Kugler, *Sternkunde ... in Babylon*, II, 1 (1913), p. 192.

⁵⁰ The Macedonian month names of the Julian calendar of the province of Arabia, and the corresponding Semitic month names (Nisan, and so on) in Nabataean inscriptions show that before the annexation of the Nabataean kingdom and organization of the province the population had used a lunisolar calendar, probably of the Seleucid (Babylonian) type. Cf. J. Cantineau, *Les Nabatéens*, II (1932), pp. 10, 20, 24, and so on. Cf. *op. cit.*, index, p. 104. The inscription in Cantineau, p. 19, is interesting. It is dated: year 24 of the king Rabbel, that is year 405, "according to the counting of the Romans", that is the Seleucid era (A. D. 94).

⁵¹ S. H. Taqizadeh, *BSOAS*, 9 (1937-1939), p. 207; W. Lentz, *Abhandl. der Preuß. Akad.*, 1938, № 7. There existed tables which gave approximate equations between Islamic and Persian calendars. Cf. B. Spuler, *Byzantin. Zeitschr.*, 44 (1951), p. 546.